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**FOUR NEW SPECIES OF ONTHOPHAGUS FROM MEXICO AND
THE UNITED STATES (COLEOPTERA; SCARABAEIDAE)**

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ABSTRACT—Four new species of Mexican and United States *Onthophagus* Latreille are described: **cartwrighti** from Southern California and Baja California, **cuevensis** from Tamaulipas and San Luis Potosi, and **neomirabilis** and **subcancer** from Oaxaca.

In 1932 Boucomont published a paper entitled, "Synopsis des *Onthophagus* d'Amerique du Sud." The title is misleading, since the paper is an extensive review of the genus for the New World from Mexico southward. Common species north of Mexico were included, but obviously no careful study was made of the Canadian and United States species. This was rectified with the publication by Howden and Cartwright of the "Scarab beetles of the genus *Onthophagus* Latreille north of Mexico" (1963). Scattered descriptions of Central and South American species have appeared since 1932, but no one has radically altered the groupings established by Boucomont.

The present paper describes 1 species from Southern California and Baja California, not included in Howden and Cartwright's 1963 revision, and 3 from Mexico. None of the 3 Mexican species falls readily into groups established by Boucomont, and none is closely related to described North or Central American species.

Photographs used herein, except for figs. 8 and 12, were taken using a JEOL-U3 scanning electron microscope. Specimens were not coated or treated, specimen charging being largely eliminated by the use of low voltages (1.8 to 2.0 KV).

Onthophagus cartwrighti Howden, new species
fig. 3, 4, 5

Holotype: Male, major, length 7.0 mm, greatest width 3.8 mm. Very similar to *velutinus* Horn (see Howden and Cartwright, 1963, p. 105), differing from male majors of *velutinus* as follows: clypeus more reflexed anteriorly, most discal punctures discrete, posterior margin with distinct carina; frons coarsely punctate,

a few punctures with minute setae; vertex (fig. 3) with 2 nearly vertical horns, horns more widely separated than is usual in *velutinus* (fig. 1, 2) and with inner basal swellings (fig. 3); pronotum with pronounced median swelling (fig. 4), surface behind swelling with numerous small tubercles overhanging small punctures, a few punctures with minute setae; pronotal surface between punctures very finely granulate, shining; elytra similar to *velutinus* but with tubercles on intervals less conspicuous and with very short setae, surface less dull; ventrally similar to *velutinus* but lacking long, conspicuous setae except near coxae.

Male minor: Unknown.

Allotype: Female, length 7.5 mm, greatest width 4.2 mm. Differing from male majors as follows: head (fig. 5) narrower; clypeus less reflexed anteriorly, disc transversely rugose, posterior marginal carina more elevated; vertex behind eyes with distinct carina (fig. 5), lacking horns; pronotum with more pronounced and wider swelling than in male (fig. 5) and much better developed than in female *velutinus* (fig. 6), the swelling highest laterally; forelegs less elongate than in male (a sexual character found in most North American *Onthophagus*).

Type Material: Holotype, male major, 20 mi. N. Comondu, L. (Baja) California, 23 July 1938, Michelbacher and Ross (CAS). Allotype, female, Triunfo, L. Cal., 13 July 1938, Michelbacher and Ross (CAS). Paratypes: 3 ♂, 1 ♀. 1 ♂, 5 mi. W. San Bartolo, L. Cal., 13 July 1938, Michelbacher and Ross (H.H.); 1 ♂, Cal. (no other data, Carnegie); 2 ♂, Calif., San Diego Co., Scissors Crossing, 30 and 31 July 1964, E. Kaen, J. Hammer (H.H., Sleeper).

Variation occurs mainly in size and in the degree of development of the horns in the males. In males length varies from 7.0 to 8.1 mm and greatest width from 3.7 to 4.3 mm. The 1 female paratype measures 6.4 mm in length and 3.6 mm in greatest width. Variation in the horns of the males is considerable. The horns vary in length, degree and angle of separation, and 2 of the males lack any indication of the inner basal swelling. In the latter 2 specimens the horns are similar to those of well developed males of *velutinus*, but are more widely separated.

Onthophagus cartwrighti can be separated from *velutinus* (to which it keys in Howden and Cartwright, 1963) by the following characters: pronotal swelling distinct in both sexes (fig. 4, 5), pronotal tubercles and accompanying punctures more numerous, and dorsal setae much less conspicuous. In males the more widely separated horns, often with an inner basal swelling, is an additional character.

It should be mentioned that males of *velutinus* from Arizona generally have the horns more widely separated than males from Texas (fig. 1, 2), but the slight development of the pronotum is constant. The pronotal development in females of *cartwrighti* could possibly cause them to be confused with male minors of *browni* H. & C. All New World male *Onthophagus* have the last abdominal segment narrowed medially to receive the pygidium, whereas females have the last abdominal segment the same width throughout. This character



Fig. 1-9. *Onthophagus* spp.: 1, *O. velutinus*, male major from Del Rio, Texas. 2, *O. velutinus*, male major from Prescott, Arizona. 3-4, *O. cartwrighti*, male major from San Diego Co., California. 5, *O. cartwrighti* female. 6, *O. velutinus*, female. 7-8, *O. subcancer*, male major. 9, *O. subcancer*, female.

will prevent possible confusion between *cartwrighti* and *browni*. Also the range of *cartwrighti* alone will separate it from any presently known related species.

The species is named for O. L. Cartwright, who has done much to advance our knowledge of North American Scarabaeidae.

Onthophagus cuevensis Howden, new species

fig. 10, 11

Holotype: Male major, length 9.1 mm, greatest width 4.9 mm. Color dorsally black, vertex and pronotum dark green, sometimes appearing black depending

on angle of light; ventrally black with tibiae and tarsi dark brown. Clypeus broadly arcuate, faintly emarginate medially, margin shallowly reflexed; surface of disc irregularly punctate, appearing rugose; clypeal-frontal junction delimited by 2 low carinae. Frons moderately convex with scattered small punctures, surface between punctures smooth and shining. Vertex (fig. 10) with abruptly elevated transverse carina between eyes, each side of carina terminating in a vertical horn; vertex behind carina impunctate, alutaceous laterally. Gena with sides rounded, evenly arcuate with clypeus; surface coarsely punctate. Pronotum (fig. 11) transversely swollen behind head, anterior face almost vertical above margin, laterally with concave notch on either side; pronotal disc coarsely punctate with fine secondary punctures interspersed; surface between punctures smooth and shining. Elytra with striae obsolete, indicated by a doubled line interrupted by vague punctures, punctures more distinct laterally; intervals with 2 irregular rows of small tubercles, each with minute seta at posterior margin; surface between tubercles slightly irregular, shining. Pygidium convex in apical $\frac{1}{2}$, smooth and shining apically. Fore legs not noticeably elongate, tibial spur sharply bent inward. Metasternum coarsely punctate near margins, impunctate along midline. First 3 abdominal segments impunctate and smooth in median $\frac{1}{3}$, coarsely punctate laterally; remaining segments coarsely punctate, most punctures with an erect seta.

Paratype: Male minor, length 6.6 mm, greatest width 3.5 mm. Differing from male major as follows: color dark brown, pronotum with greenish hue; clypeal-frontal carina only slightly elevated; transverse carina on vertex low, not abrupt, horns lacking, indicated by obtuse angle on each side half-way to midline; pronotal protuberance evident only as a slightly elevated, broad convexity behind head, lacking lateral concavities.

Allotype: Female, length 7.1 mm, greatest width 3.6 mm. Color as in male major. Characters of head as described for male minor. Pronotum with anterior protuberance slightly more pronounced than in male minor, slightly concave on either side of swelling; pronotal punctures more numerous than in male major; pygidium only slightly convex. Otherwise similar to male major except terminal abdominal segment of uniform width, not narrowed medially as in males.

Type Material: Holotype, male major, Mexico, San Luis Potosi, 3600 ft., 15 mi. W. El Naranja, 18 June 1971, A. Newton, #237, in trap baited with feces (H.H.). Allotype, ♀, Mexico, San Luis Potosi, Cueva de Los Avales, 16 April 1965, Reddell, Mckenzie (USNM). Paratypes, 5 ♂: 3, same data as Allotype; 2, Mexico, Tamaulipas, Cueva de Rancho del Cielo #7, 2 June 1964, J. Reddell, D. Mckenzie, L. Manire (USNM, H.H.).

Variation in the size of the 5 male paratypes is from 6.5 to 10.0 mm in length and from 3.5 to 5.5 mm in greatest width. Variation in the degree of development of the carinae of the head and of the pronotal protrusion is included in the descriptions of the male major and minor. The only unusual aspect is that the degree of development of the carina on the vertex does not seem to be correlated with body size. One male paratype measuring 8.7 mm in length has the carina of the vertex distinctly elevated but lacks any indication of the lateral horns.

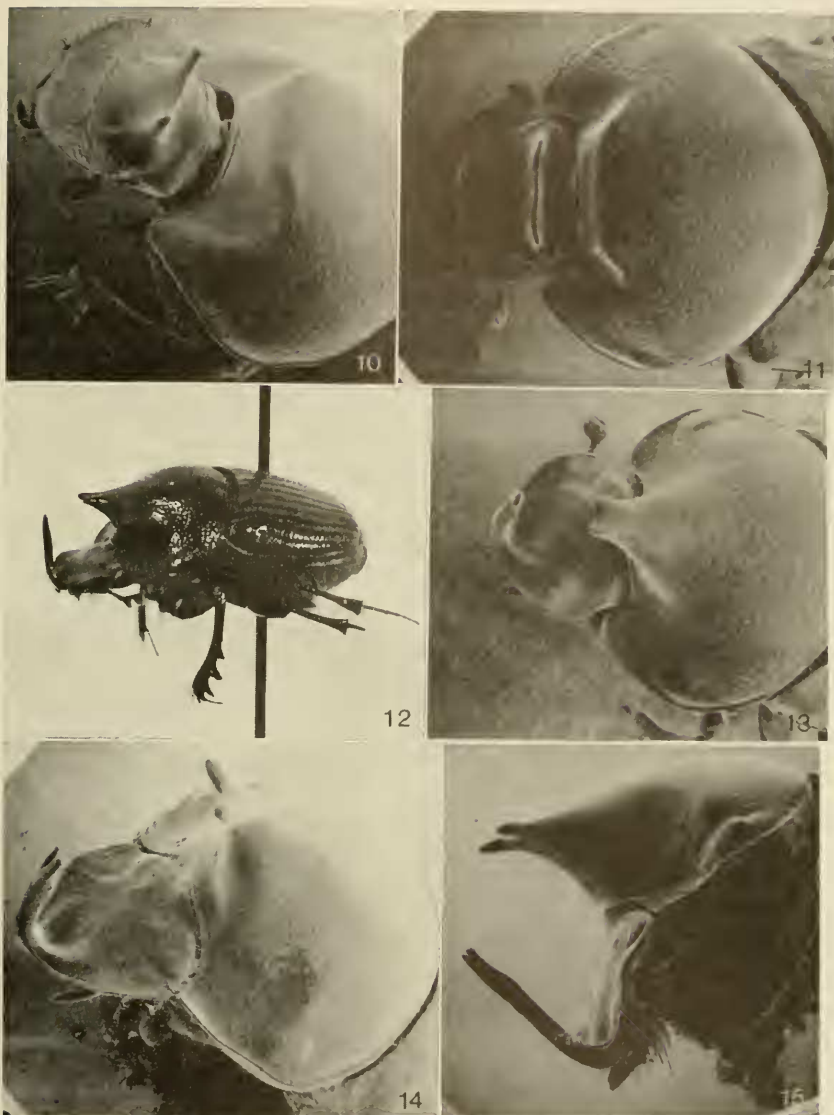


Fig. 10-15. *Onthophagus* spp.: 10-11, *O. cuevensis*, male major. 12-13, *O. neomirabilis*, male major. 14-15, *O. mirabilis*, male major.

A smaller specimen, measuring 7.5 mm in length, has the lateral horns on the carina relatively well developed. Usually the degree of development of the male sexual characters is correlated with size, at least in the genus *Onthophagus*.

Onthophagus cuevensis cannot readily be placed in any of Boucomont's (1932) groups. Males may key to group 5, but are more closely related to species in groups 1 and 9. Characters of the pronotum and elytra relate *cuevensis* to *brevifrons* Horn, *hypopotamus* Harold, etc., but the carina on the vertex with the lateral horns is closest to *coproides* Horn. The greenish color of the pronotum, horns and carina on the vertex of the males and the broad pronotal protrusion will separate *cuevensis* from any of these species. All of the related species occur in mammal nests or burrows and *cuevensis* seems, likewise, to have unusual habits. The majority of specimens were taken in caves, probably associated with bat guano. The Spanish word for cave is "cueva" and the name of the species is derived from the Spanish.

Onthophagus neomirabilis Howden, new species

fig. 12, 13

Holotype: Male major, length 10.3 mm, greatest width 5.7 mm. Color dark brown, pronotum noticeably darker. Clypeus with long, slender, vertical horn (fig. 12) at anterior margin, apex of horn rounded and flattened, slightly narrowed; disc of clypeus with a distinct concavity behind horn occupying $\frac{2}{3}$ of clypeal width; posterior clypeal suture obsolete medially, marginal juncture of clypeus and gena broadly rounded. Frons and vertex nearly flat, with shallow transverse depression between eyes; surface finely punctate. Pronotum (fig. 13) with anterior, median conical projection extending over head; apex of projection flattened and emarginate, slightly bifurcate; pronotum on each side near margin at anterior $\frac{1}{3}$ with low callosity; pronotal surface coarsely punctate, punctures separated by a distance approximately equal to their diameters; surface between smooth and shining. Elytra (fig. 12) with distinct striae, striae with large, distinct punctures separated by a distance equal to 2 or 3 times their diameters; intervals broadly convex, moderately, irregularly punctate, the numerous punctures giving intervals a roughened appearance; surface between punctures smooth and shining. Pygidium only slightly convex, heavily and coarsely punctate. Fore legs elongate, as is typical for males of many species in the genus. Prosternum laterally smooth, lacking punctures except near margins. Middle and hind femora with outer surfaces smooth, only a few vague fine punctures present. Metasternum with scattered coarse punctures except along midline. Abdominal segments each with transverse row of coarse punctures near anterior margin.

Male minor and female: Unknown.

Type Material. Holotype. Male major, 4000 ft., Km. 140 on Oaxaca Hwy. 140 (15 mi. S. of Valle Nacional), Oaxaca, Mexico, 22 May 1969. H. F. Howden, taken in trap baited with feces (H.H.).

This species is very close to *Onthophagus mirabilis* Bates (fig. 14, 15) which Boucomont (1932) places in his group 7. Bates (1887) based his description of *mirabilis* on a single male major taken at

Rio Morona, Ecuador. I have seen the type which is now in the Oberthur collection in the Museum National d'Histoire Naturelle, Paris. I also have examined a second specimen that I believe to be *mirabilis*, labeled "Volcan Chiriqui, Panama, 4000', 19 July 1936" (USNM). Illustrations of *mirabilis* used in this paper are of the Panamanian specimen.

Onthophagus neomirabilis can be separated from *mirabilis* by the following characters: clypeal horn with apex rounded, not bifid as in *mirabilis* (fig. 14); pronotal protrusion as in fig. 13, not distinctly bifid with tips divergent as in *mirabilis* (fig. 14); punctures of elytral striae more pronounced than in *mirabilis*; prosternum laterally predominantly smooth (*mirabilis* has fine punctures); middle and hind femora with a few, vague fine punctures, in *mirabilis* numerous fine punctures are present.

Onthophagus subcancer Howden, new species

fig. 7, 8, 9

Holotype: Male major, length 6.5 mm, greatest width 3.7 mm. Color dorsally very dark brown; elytra vaguely mottled with reddish brown, apices and bases near humeri distinctly reddish brown; pygidium brown; ventrally dark brown except legs brown. Clypeal margin anteriorly shallowly emarginate, emarginate portion forming base of long, slender, upright, slightly curved, nearly cylindrical horn (fig. 7); sides of clypeus divergent to expanded and reflexed genae; clypeal disc concave behind horn, moderately punctate only near lateral margins; clypeal-frontal suture obsolete. Frons and vertex nearly flat, finely punctate, shining. Pronotum (fig. 7, 8) with an anteriorly directed biconical protrusion extending over anterior pronotal margin; width of protrusion slightly less than distance between eyes; pronotum on either side of protrusion concave to reflexed anterior angles; pronotal surface, except at apex of protrusion, with scattered shallow punctures, punctures separated by a distance equal to 3 to 4 diameters; each puncture with a very minute seta, surface between punctures with extremely fine secondary punctures, otherwise smooth and shining. Elytra with shallow striae, striae delimited by double lines interrupted by shallow punctures; intervals nearly flat, having numerous irregularly scattered punctures, each puncture with minute seta; surface between punctures smooth and shining. Pygidium slightly convex, surface heavily, coarsely punctate. Fore legs greatly elongated, with tuft of hairs at tibial apices. Metasternum centrally with punctures similar to those of pronotum, punctures becoming coarse laterally; metasternal midline indented in posterior $\frac{2}{3}$. Abdominal segments each with transverse row of fine setose punctures near anterior margins; a few long setae present laterally on last 3 segments.

Paratype: Male minor, length 4.9 mm, greatest width 3.0 mm. Differing from male major in the following respects: clypeus truncate anteriorly, majority of truncate margin vertically elevated into a flat triangular horn, slightly wider than high; sides of clypeus behind truncate margin evenly diverging to slightly expanded genae; clypeal surface irregular medially, coarsely punctate laterally; genae, frons and anterior of vertex punctate, each puncture with minute seta; pronotum anteriorly with 2 slightly rounded humps 0.5 mm behind anterior

margin, otherwise surface evenly convex and more conspicuously punctate than in male major; elytral intervals slightly less heavily punctate; pygidium less heavily punctate, setose near apex, surface between punctures shining; fore legs less elongate, but still more than in females.

Allotype: Female, length 5.9 mm, greatest width 3.3 mm. Differing from male major in the following respects: clypeus (fig. 9) narrowly emarginate anteriorly, shallowly reflexed; sides of clypeus evenly divergent to genae, sides of which are even with clypeus; clypeal disc transversely rugose; clypeal-frontal junction with low carina; frons and vertex slightly convex, surface punctate, punctures similar to those on pronotum; pronotum evenly convex, punctures more numerous than in male major, usually separated by a distance equal to less than 1 diameter, each puncture with minute seta; pygidium similar to male minor; fore legs not elongate, lacking tuft of setae at tibial apices; terminal abdominal segment of uniform width, not narrowed medially as in males.

Type Material: Holotype, male major, Mexico, Oaxaca, 4800', 18 mi. S. Valle Nacional, 31 July 1971, A. Newton, #304 (H.H.). Allotype, ♀, Mexico, Oaxaca, 4000', 15 mi. S. Valle Nacional, 12 August 1970, A. Newton, dung trap (H.H.). Paratypes, 15 ♂, 9 ♀. 13 ♂, 6 ♀, same data as Holotype; 2 ♂, 3 ♀, same data as Allotype (CAS, CNC, USNM, MCZ, HH, and Newton).

Variation is largely covered in the descriptions of the major and minor males and of the female. Males vary from 4.9 to 7.0 mm in length and from 3.0 to 4.0 mm in greatest width. Females vary from 5.4 to 6.6 mm in length and from 3.0 to 3.8 mm in greatest width. There is some variation in the extent of the reddish-brown markings on the elytra, but the basal and apical markings are present in the entire series.

Onthophagus subcancer will most readily key to Boucomont's (1932) group 3. It can be separated from the species in that group on the basis of the long, slender horn at the anterior clypeal margin in male majors, the biconical pronotal projection present on most males, and the overall dark brown color with bases and apices of the elytra reddish brown. The shape of the clypeal horn is not unlike that of *neomirabilis*, but the smaller size, color, and smoother elytra will readily separate *subcancer*.

ACKNOWLEDGMENTS

A number of persons and institutions have assisted me with the present work. I am particularly indebted to Mr. A. Newton, Harvard University, Cambridge, Mass., who collected and gave me many of the specimens included herein. Other specimens were made available through loan by Dr. Robert Gordon, Systematic Entomology Laboratory, USDA, Washington, D.C., Mr. Hugh B. Leech, California Academy of Sciences, San Francisco, Calif., and Dr. Elbert L. Sleeper, California State College, Long Beach, Calif. Dr. A. Descarpentries and Mme. A. Bons, Museum National d'Histoire Naturelle, Paris, were most helpful with questions concerning the type of *Onthophagus mirabilis* Bates. Mr. Colin Jones, Staff Photographer, Carleton University, aided with the photography and Mr.

Lewis Ling, Carleton University, took the S.E.M. pictures. I am grateful to all of these individuals and institutions for their generous assistance. The work has been supported by an operating grant from the National Research Council of Canada.

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SAWFLIES OF THE SUBFAMILY HETERARTHRIINAE IN SOUTH AMERICA (HYMENOPTERA: TENTHREDINIDAE)

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ABSTRACT—A key is given to the 3 genera of Heterarthrinae that occur in South America. *Caliroa* O. Costa is represented by an introduced species, *C. cerasi* (L.) that occurs in Chile, Argentina, and Uruguay. *Brasinusa* Malaise is known from southern Brazil and possibly northern Argentina and includes *B. plaumanni* Malaise. *Notofenusus* Benson is found in Chile and southern Argentina, and 4 species from Chile and includes: *N. surosa* (Konow), *N. asorusa*, n. sp., *N. flinti*, n. sp., and *N. nema*, n. sp. *Notofenusus cognata* (Spinola), new combination, is also included, but the species cannot be placed.

The Heterarthrinae are poorly represented in the Neotropical Region and are found only in the southern section of South America. Three genera are known, and one, *Caliroa* O. Costa of the tribe Caliroini, is represented by only the introduced species *C. cerasi* (L.). The other 2 genera, *Brasinusa* Malaise and *Notofenusus* Benson of the tribe Fenusini, are very closely related to several Nearctic genera. All members of this subfamily in South America are small and black, the smallest of the family Tenthredinidae. Hosts are not known for the South American species, but all the North American species of Fenusini are leafminers in the larval stage.

Key to Genera of Neotropical Heterarthrinae

1. Vein 2A & 3A of forewing complete, connected to 1A by an anal crossvein
 [Caliroini] *Caliroa* O. Costa

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